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THESIS

THE RETURNS TO HUMAN CAPITAL MIGRATION WITHIN THE DEPARTMENT OF DEFENSE CIVILIAN INTERNAL LABOR MARKET

by

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September 2005

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13. ABSTRACT (maximum 200 words)

The objective of this thesis is to examine the returns to mobility of civilian personnel within the Department of Defense (DoD). This study employs panel data provided by the Defense Manpower Data Center (DMDC) and drawn from the Department of Defense Civilian Personnel Data Files. The dataset consisted of 21,143 personnel who were new hires in years 1994-1995. Between 1994-1995 and 2003, 3,267 (15.4%) employees were interstate migrants. The data were set up as an unbalanced panel with a total of 132,068 observations.

This study uses ordinary least squares (OLS), probit and Heckman selection-correction techniques to explore two returns to mobility measures: compensation and promotion. Multivariate models were specified and estimated for each performance measure. The results indicated workers who migrate are more likely subsequently to be promoted. Migration is a strategic move for workers to advance and maximize their personal utility since migrants earn higher salaries than non-migrants. Females present no evidence of tied-mover effects, and pursue promotion and salary opportunities like males. Women promote faster than men, and women migrants increase their promotion rates even more. Females, however, earn lower salaries than males. The models also reveal that veterans earn lower salaries than non-veterans and have no significant advantages in promotion over their counterparts.

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THE RETURNS TO HUMAN CAPITAL MIGRATION WITHIN THE DEPARTMENT OF DEFENSE CIVILIAN INTERNAL LABOR MARKET

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I. INTRODUCTION

A. BACKGROUND

Since the middle of the twentieth century, labor migration has been the subject of extensive studies. These studies have primarily focused on the determinants and the effects of migration in the labor market. Migration is often viewed as an adjusting mechanism that alleviates economic imbalances in the labor market. When workers move in pursuit of individual utility maximization, they shift the labor supply in the market. The quantity of labor demanded then adjusts to reach an efficient allocation of services, thus establishing a new equilibrium point.

Studies based on the human capital model view migration as an investment in human capital stock. Human capital stock is constantly accumulated during an employee's lifespan in the form of experience. Additionally, migration and education enhancement also increase human capital investments. Those individuals who invest in human capital must believe that the near-term costs of augmenting their human capital stock, i.e. moving or going back to school, outweigh the discounted stream of future benefits once the investment is undertaken.

When it comes to migration, there are various costs associated with moving the worker must consider. Such direct monetary costs include moving expenses, lodging expenses, and any other expense that diminishes the worker's financial position. Psychic costs to the individual must also be evaluated, and include factors such as how attached the worker is to the originating community,

and to what degree of an inconvenience it is to transfer to another location.

Human capital can be divided into two types: general and specific. General human capital enhances worker productivity universally. Adequate knowledge of general mathematical procedures is a piece of general human capital, because it can be utilized at many places of employment. On the other hand, specific human capital enhances worker productivity only within a distinct place of employment. Training in the use of a specific piece of proprietary software unique to one company is an example of specific human capital; it cannot be transferred if the worker migrates to a company that does not utilize the same software. It is this specific human capital that is typically lost in the process of migration.

While the literature regarding migration offers many studies as to its monetary returns, limited information is available regarding migration within internal labor markets. Internal labor markets can often avoid the loss of specific human capital because it is frequently transferable within the organization, regardless of migratory patterns. Furthermore, psychic costs can be reduced as the workers already have information regarding various aspects of the company, thus the anxiety of moving is somewhat diminished. The Department of Defense (DoD) is an internal labor market that observes large scale economic effects within its own system. Migration within the DoD is unique in that there is a diminished loss of specific human capital and there are less psychic costs associated with moving. Because of these decreased costs, people may have a tendency to move for reasons other than monetary or

professional gains (because it will take less benefit to overcome the decreased cost) and movers might behave differently than in external labor markets. It is of interest to see if the returns to migration within the Department of Defense compare to those in general external labor markets.

B. OBJECTIVES

The purpose of this study is to identify the returns to migration, both in terms of salary expectations and promotion opportunities for civilian personnel within the DoD internal labor market. Furthermore, it is of interest to explore whether gender differences exist in the DoD. Finally, because veterans may have superior information, regarding DoD opportunities, and may experience lower psychic costs due to their familiarity with DoD processes, it is relevant to observe how veterans behave compared to non-veteran counterparts regarding migration, wages and promotion.

C. SCOPE, LIMITATIONS AND ASSUMPTIONS

The data analyzed were limited to full-time, General Schedule Department of Defense employees who were paid annually. Demographic variables were limited to gender, race, education, prior military service and labor market experience. Our data did not include marital status, which could influence migration because of tied-movers or stayers, or family size which is a large determinant of the cost of moving. Salary was restricted to base pay only, not accounting for any kind of bonuses which may affect migration choices. It is assumed that the data used for

this study, specifically state, grade and salary information, are accurate.

D. COURSE OF THE STUDY

Five chapters comprise this thesis. Chapter II reviews pertinent literature and previous studies conducted on the subject of migration. Chapter III describes the dataset and variables used for the models. It also explains the statistical models and techniques used for the study. Chapter IV consists of preliminary analyses, multivariate ordinary linear models analyses, probit regression analyses, and Heckman selection-correction estimates. Chapter V summarizes the conclusions of the analyses and presents recommendations for further study.

II. REVIEW OF LITERATURE

A. THE GENERAL SCHEDULE SYSTEM

The General Schedule (GS) System was established in the United States with the Classification Act of 1949. This federal pay system established a standard for placing positions according to class and grade. The Office of Personnel Management (OPM), in conjunction with other federal agencies, defines the various classes in terms of duties, responsibilities and qualification requirements (OPM 1995, 3). The GS system classifies positions in the administrative, clerical, professional and technical occupations and consists of 15 grades with ten steps within each grade. Grades correlate to salary levels and steps within grade also incur smaller increases in pay. Employees advance through the series of steps and grades according to performance and length of service.

As within the military force, compensation for GS employees is adjusted for local cost-of-living differences in the form of an allowance called locality pay. The amount of locality pay varies depending on the geographic location of the employee. Employees are also eligible for relocation bonuses only if the employee must relocate to accept a position that is deemed by OPM, or an affiliate agency, to be difficult to fill in the absence of the bonus. The amount of the relocation bonus can be up to 25 percent of the annual rate of the employee's basic pay. Should an employee's unusually high or unique qualifications be deemed essential to an agency to retain an employee, a retention incentive is also offered in the form of a continuation bonus. Like the relocation bonus,

the retention incentive cannot exceed 25 percent of the employee's basic salary. Table 1 shows the base salaries corresponding to grade and step for the year 2003.

Table 1. General Schedule 2003 Base Salaries*

Grade	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
1	15,214	15,722	16,228	16,731	17,238	17,536	18,034	18,538	18,559	19,031
2	17,106	17,512	18,079	18,559	18,767	19,319	19,871	20,423	20,975	21,527
3	18,664	19,286	19,908	20,530	21,152	21,774	22,396	23,018	23,640	24,262
4	20,952	21,650	22,348	23,046	23,744	24,442	25,140	25,838	26,536	27,234
5	23,442	24,223	25,004	25,785	26,566	27,347	28,128	28,909	29,690	30,471
6	26,130	27,001	27,872	28,743	29,614	30,485	31,356	32,227	33,098	33,969
7	29,037	30,005	30,973	31,941	32,909	33,877	34,845	35,813	36,781	37,749
8	32,158	33,230	34,302	35,374	36,446	37,518	38,590	39,662	40,734	41,806
9	35,519	36,703	37,887	39,071	40,255	41,439	42,623	43,807	44,991	46,175
10	39,115	40,419	41,723	43,027	44,331	45,635	46,939	48,243	49,547	50,851
11	42,976	44,409	45,842	47,275	48,708	50,141	51,574	53,007	54,440	55,873
12	51,508	53,225	54,942	56,659	58,376	60,093	61,810	63,527	65,244	66,961
13	61,251	63,293	65,335	67,377	69,419	71,461	76,503	75,545	77,587	79,629
14	72,381	74,794	77,207	79,620	82,033	84,446	86,859	89,272	91,685	94,098
15	85,140	87,978	90,816	93,654	96,492	99,330	102,168	105,006	107,844	110,682

Promotion within grade in the GS system consists of a maximum increase of two steps above the salary prior to promotion. Advancement to a higher step represents a 3% salary increase, while promotion to a higher grade results in a 10% salary rise (Spyropoulos 2005, 3). To be eligible for promotion, employees must meet the position's qualification requirements, time-in-grade requirements and have satisfactory performance ratings.

B. THE HUMAN CAPITAL MODEL

All workers embody a set of knowledge, skills and abilities collectively referred to as human capital. The human capital model suggests that investments in human capital "stock" at an earlier period yield higher returns (wages) over the long run. Workers assume three primary

* From Office of Personnel Management. Salary Table 2003-GS. [online]; available from http://www.opm.gov/oca/03tables/html/gs.asp. Accessed 13 August 2005.

types of human capital investments throughout their lifetime: 1) increases in education, experience and training, 2) migration and 3) new job search. In the model, worker migration is further viewed as a net present value calculation. Workers incur costs associated with migration in the near term in order to enhance their utility at a later period. If the discounted benefits associated with the move exceed the costs over the long run, including psychic and monetary costs, the person will move. This calculation is exemplified in the Net Present Value formula:

$$\text{Present Value of Net Benefits}^{\dagger} = \sum_{t=1}^{T} \frac{B_{jt} - B_{ot}}{(1+r)^t} - C,$$

where:

B_{jt} = the utility derived from the new job (j) in year t

B_{ot} = the utility derived from the old job (o) in year t

T = the time length (in years) expected to work at job j

r = the discount rate

C = the utility lost in the move itself (direct and psychic costs)

$\sum$ = the sum of the yearly discounted net benefits over a period of time from year 1 to year T

† From Ronald Ehrenberg and Robert Smith. *Modern Labor Economics: Theory and Public Policy*. 8th ed. (New York: Addison Wesley, 2003), 311.

As the formula demonstrates, so long as the utility derived from the new job (j) exceeds the utility derived from the old job (o), accounting for all other psychic and monetary costs associated with the move, and discounting over time (T), we can assume that the individual will decide to move. This is because the net present value of the benefits of moving exceeds all the costs.

C. PREVIOUS MIGRATION STUDIES

There is an extensive amount of studies on migration. Michael Greenwood, in his *Research on Internal Migration in the United States: A Survey* (1975), provides a comprehensive summary of contemporary migration studies dealing with the determinants of migration. Among the many studies mentioned, the works of Schultz (1961), Becker (1962) and Sjaastad (1962) emphasize the notion that people move to enhance individual utility (such as wages), and that migration is a form of human capital investment. Their findings claim that the income the mover expects to earn at each alternative destination influences his decision to move. Greenwood further emphasizes the human capital model by telling us that "the relevant income measure... is the present discounted value of his expected future stream of net returns" (1975). Still focusing on wages, Lansing and Morgan (1967) further compare the incomes of migrants and non-migrants. Their study finds that even when controlling for education, migrants have lower annual incomes that non-migrants. Wertheimer (1970) estimates the returns to U. S. migration for south to north as well as rural to urban migration and concludes that monetary returns do not emerge until after the fifth year

following the move, suggesting that migrants must be accepting “immediate earnings cuts for greater growth of future earnings” (Greenwood 1975). Hunt and Kau (1985) find that repeat migrants experience higher wages over non-migrants and one-time movers.

It is acknowledged that psychic costs impact the decision to migrate by influencing the costs of migration. Some studies have used distance as a proxy for psychic costs (Sjaastad 1962); while others transform these costs into permanent transformation costs (Schwartz 1973). Schwartz argues that psychic costs can be monetized by calculating the needed frequency of visits to the place of origin by the mover. Furthermore, he claims that frequency is likely to increase with age; therefore, psychic costs of moving are likely to rise with age along with the deterring effects of distance. Greenwood (1975) suggests that the psychic costs of moving away from family and friends or the psychic benefits of moving closer to them may be substantial enough to affect migration behavior.

Other costs of migration include the loss of specific human capital. Information regarding the workplace procedures and other locality information also affects the migration decision. Greenwood’s survey reveals that information about a certain locale increases the propensity of that person to move to that area, rather than another for which the person knows nothing about (1975).

Studies reveal certain demographic characteristics are likely to exert influence on the decision to migrate. Age, education level and race are factors affecting migration (Greenwood 1975). The probability that a worker will migrate is likely to decrease as age increases.

Employment information and job opportunities are both expected to increase with increased education (Greenwood 1975). Furthermore, the correlation between education and migration becomes stronger as distance increases (Suval and Hamilton 1965, Hunt and Kau 1985), suggesting that the market for the better-educated tends to be more national in scope, and more and better information concerning job opportunities are available to better-educated people.

While the literature available on migration primarily focuses on its monetary returns, the literature research found no previous studies isolating migration's effect on promotion. Perhaps this is because, in general, promotions generate an increase in wages. Studies pertaining to promotion in the General Schedule system, however, were conducted. A recent study by Spyropoulos (2005) revealed that females received lower salaries and were less likely to be promoted than men even though they received better performance ratings. Minorities were also paid less than non-minority workers; and veterans were paid more, performed better, and were more likely to become supervisors. Studies also found a strong correlation of education with both wages and promotion (Asch 2001, Spyropoulos 2005), suggesting that better educated employees tend to be paid more and are promoted faster. Contrasting Spyropoulos, Mehay and Pema (2004) found that women have superior promotion rates compared to men, and experience higher salary growth rates over time; however, they are less likely to be promoted to supervisory positions. No studies analyzing migration strictly within an internal labor market were found.

III. DATA AND METHODOLOGY

A. DATASET

This study employs panel data provided by the Defense Manpower Data Center (DMDC) and drawn from the Department of Defense Civilian Personnel Data Files. The dataset consisted of two cohorts. The first one includes 17,053 civilian employees who were hired in 1994 and whose careers were tracked until 2003. The second cohort consists of 16,530 personnel employed in 1995 who were also followed until 2003. The dataset was refined by removing data that were obviously erroneous or unnecessary for the purpose of this study. This dataset was then restricted to General Schedule personnel who worked on a full-time status and were between the ages of 21 to 61 at the time of service entry. The final dataset consisted of 21,143 personnel of whom 3,267 (15.4%) were interstate migrants. The data were set up as an unbalanced panel with a total of 132,068 observations.

B. VARIABLE INTRODUCTION

1. Dependent Variables

The models in this study analyze the effect of migration on salaries and promotion. The first outcome is the yearly compensation of each employee (*yrcomp*). Its natural log form, *lyrcomp*, is used in the regressions and equals the natural log of each employee's annual wages. The natural log is used to account for wage changes due to inflation. As previously mentioned, the yearly compensation variable accounts for annual base pay and

excludes any potential bonuses an individual might have received.

Promote is a dichotomous variable equal to one if the individual was promoted from one grade to another during the observed year. This variable was generated by observing the change in grade from one year to the next. If the individual moved up in grade from one year to the next, *promote* takes a value of one, zero otherwise.

2. Independent Variables

Independent variables are the explanatory factors that have the potential of affecting wages or promotion. The independent variables included in the regressions attempt to capture human capital endowments and background characteristics.

Migrate is a dichotomous variable equal to one if the individual moved from one state to another in a given year. People migrating abroad were excluded from the sample. *Migrate* is the primary variable of interest in this study.

Grade is a continuous variable equal to the General Schedule paygrade of the individual during the year it was observed.

Years of federal service (*totfedyrs*) account for an individual's federal experience or tenure, prior to being hired in 1994-1995. As with every experience variable, its squared form (*totfedysq*) is included in the regressions to control for any diminishing returns in wages or promotions.

Labor market experience (*lmktexp*) and experience squared (*lmktexpsq*) represent the years of working experience an individual had before entering civil service

for the Department of Defense. The variable was generated for each individual by subtracting education years, years of federal experience, and six (a base value) from age at the time of hiring. Age and years of education variables were provided in the original DMDC datasets.

To account for performance, the performance evaluation rating (*perf*) of each individual was reported during the year when it was observed. Performance ratings take integer values from one to five, with five given to the best performing employees.

To control for education, dichotomous variables were generated for personnel who entered civil service with a Baccalaureate (*bach0*), a Master's (*mastr0*), or a Doctorate (*phd0*) degree.

Demographic controls for race (*white*, *black*, *hisp*, *othrace*) and gender (*female*) were included in all specifications. A female-migrate interaction term (*femmig*) was created to control for tied-mover effects, since females are more likely to move to maximize total household utility, rather than personal job enhancement.

Department of Defense Agency dummies were used to control for agency specific factors. These included *army*, *navy*, *usmc*, *usaf*, and other DoD agency (*othagcy*). Examples of other agencies include the Defense Advanced Research Projects Agency (DARPA), the Defense Commissary Agency (DECA) or the Defense Logistics Agency (DLA).

Controls for veteran status (v*etrn*) were included primarily to observe veteran behavior, but also because veterans receive total federal service years credit for military experience. Additionally, veterans may receive

preferential treatment at hiring and may choose different career paths due to prior service.

C. MODELS

1. The Salary Model

The goal of this model is to estimate the determinants of yearly compensation for DoD civilian personnel. This model is estimated using Ordinary Least Squares (OLS). The sample regression function we used is as follows:

$$\log(yrcomp) = \beta_0 + \beta_1 migrate_{it} + \beta_2\, female_i + \beta_3 race_i + \beta_4 education_i + \beta_5 agency_i + \beta_6 vetrn_i + \beta_7 lmktexp_{it} + \beta_8 lmktexpsq_{it} + \beta_9 totfedyrs_{it} + \beta_{10} totfedysq_{it} + \beta_{11} year_t + \beta_{12}\, perf_{it} + \beta_{13} grade_{it} + u_{it}.$$

Being a log-level model, an increase of one in any parameter x returns a percentage change of $100\hat{\beta}_i$ on y. Because of errors for each individual are likely to be correlated over time, the estimations adjust the standard errors for autocorrelation and heteroskedasticity. Year dummies are included in all regressions to control for changes in the economy or organization over time that affect everyone the same way.

2. The Promotion Model

This model estimated the determinants of promotion within the DoD. In this model, the dependent variable *promote* takes on a value of zero or one. Estimating a model with a binary dependent variable using linear methods can yield parameter fitted probabilities greater than one or less than zero. Furthermore, linear probability models induce a heteroskedastic variance. To overcome these drawbacks, our study uses a binary response probit model.

The general form of our binary response model is as follows:

$$P(promote=1)=\Phi(\beta_0+\beta_1 migrate_{it}+\beta_2 female_i+\beta_3 race_i+\beta_4 education_i+\beta_5 agency_i+\beta_6 vetrn_i+\beta_7 lmktexp_{it}+\beta_8 lmktexpsq_{it}+\beta_9 totfedyrs_{it}+\beta_{10} totfedysq_{it}+\beta_{11} year_t+\beta_{12} perf_{it}+\beta_{13} grade_{it}+u_{it}),$$

where $0<\Phi(z)<1$.

In our promotion probit model, the partial effect of an explanatory variable, such as *migrate*, returns the change in the estimated probability of a promotion for an individual, ceteris paribus, given that the individual has migrated.

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IV. ANALYSIS

A. PRELIMINARY DATA ANALYSIS

We commence our preliminary review by looking at all personnel at their time of entry. With the aid of hindsight, we were able to identify the individuals who migrated to different states at least one time during the ten year period. The sample was then divided using this criterion and the employee's year of entry. Table 2 displays descriptive statistics for all workers who remained in service for the duration of the ten year period and highlights the statistically significant differences between migrant and non-migrant employees at their time of entry. The overall mean salary is $27,083, with migrants exhibiting around 3% higher mean salaries ($27,872) than non-migrants $(26,939). Migrants start at slightly higher grades than non-migrants, but enter federal service with lower labor market experience years (9.8 vs. 12). Female representation is about 48%. With respect to education, 23% of the sample has a Baccalaureate degree, 8% a Master's degree and 1% a Doctorate. Migrants appear to be more educated; however, individuals holding Doctorate degrees tend to become more sedentary. Minor differences in migratory behavior appear to exist among the racial groups represented, with whites forming the majority. Veterans constitute about 26% of the sample and do not seem to migrate at different rates from the rest of the group. Of the five agencies, civil service employees in the Army and the Air Force show the highest tendencies for migration, while the Navy and other DoD agency employees favor more sedentary careers. Employees in the Marine Corps

Table 2. Summary Statistics at Entry

	ALL		MIGRANTS		NON-MIGRANTS			
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	T-test	P-value
yrcomp	27083.73	11723.08	27872.17	10402.66	26939.63	11943.28	4.18	0.000
grade	7.0875	3.0933	7.4178	2.9353	7.0272	3.1176	6.64	0.000
lmktexp	11.6964	9.4427	9.8895	8.7036	12.0266	9.5349	-11.93	0.000
totfedyrs	4.6856	5.7748	4.8087	5.5878	4.6631	5.8082	1.32	0.185
bach0	0.2310	0.4215	0.2886	0.4532	0.2205	0.4146	8.52	0.000
mastr0	0.0834	0.2765	0.1093	0.3120	0.0787	0.2693	5.81	0.123
phd0	0.0163	0.1267	0.0101	0.1000	0.0175	0.1310	-3.02	0.002
female	0.4829	0.4997	0.4688	0.4991	0.4855	0.4998	-1.75	0.079
black	0.1592	0.3659	0.1726	0.3780	0.1568	0.3636	2.27	0.023
hisp	0.0476	0.2129	0.0508	0.2196	0.0470	0.2116	0.94	0.346
white	0.7257	0.4462	0.7138	0.4521	0.7278	0.4451	-1.65	0.098
othrace	0.0648	0.2462	0.0582	0.2341	0.0660	0.2483	-1.68	0.094
army	0.4120	0.4922	0.4209	0.4938	0.4103	0.4919	1.13	0.260
navy	0.1908	0.3930	0.1772	0.3819	0.1933	0.3949	-2.15	0.031
usmc	0.0194	0.1381	0.0174	0.1310	0.0198	0.1393	-0.90	0.370
usaf	0.2335	0.4230	0.2614	0.4395	0.2284	0.4198	4.11	0.000
othagcy	0.1443	0.3514	0.1230	0.3285	0.1482	0.3553	-3.76	0.000
vetrn	0.2665	0.4421	0.2553	0.4361	0.2686	0.4432	-1.58	0.114
biosci	0.0118	0.1081	0.0073	0.0854	0.0126	0.1117	-2.58	0.010
physci	0.0273	0.1631	0.0150	0.1216	0.0296	0.1695	-4.71	0.000
engineer	0.1005	0.3007	0.1564	0.3633	0.0903	0.2866	11.59	0.000
medical	0.1631	0.3695	0.1071	0.3093	0.1734	0.3786	-9.44	0.000
design	0.0132	0.1143	0.0178	0.1321	0.0124	0.1107	2.45	0.014
legal	0.0184	0.1342	0.0254	0.1574	0.0171	0.1295	3.27	0.001
educator	0.0517	0.2214	0.0425	0.2019	0.0534	0.2248	-2.57	0.010
library	0.0051	0.0713	0.0031	0.0552	0.0055	0.0738	-1.79	0.074
logitmgt	0.0614	0.2401	0.1087	0.3113	0.0528	0.2237	12.27	0.000
personnel	0.0385	0.1925	0.0361	0.1866	0.0390	0.1936	-0.78	0.433
datasys	0.0303	0.1713	0.0266	0.1610	0.0309	0.1731	-1.32	0.187
centmgt	0.0117	0.1075	0.0178	0.1321	0.0106	0.1023	3.51	0.000
logitech	0.0638	0.2444	0.0514	0.2209	0.0661	0.2484	-3.15	0.002
mgtech	0.0869	0.2817	0.0673	0.2506	0.0905	0.2868	-4.32	0.000
clerk	0.2035	0.4026	0.1892	0.3917	0.2061	0.4045	-2.22	0.027
polfire	0.0715	0.2576	0.0701	0.2553	0.0717	0.2580	-0.33	0.741
socsci	0.0423	0.2012	0.0392	0.1941	0.0429	0.2025	-0.96	0.338
Obs.	21,143		3,267		17,876			

demonstrate no significant migration preferences. Of the many occupational groups represented, engineers and logisticians seem to have larger proportions of mobile personnel. Scientists and workers in the medical field are more non-migrant than mobile, perhaps due to licensing regulations between states and the availability of specific scientific equipment.

We now turn our attention to summary statistics for the same cohort of personnel but for those who stay in the civil service until 2003. Descriptive statistics for the year 2003 are presented in Table 3 with attention given to the differences among migrating workers and non-migrating workers. A preliminary review of the data indicated an overall mean annual salary in 2003 of approximately $49,000. The overall promotion rate is 11.5%. Because of the panel nature of the data, this figure seems misleading, but it only measures those who only promoted in 2003. Across the ten year period, the promotion rate is 0.42, with a standard deviation of 0.49. The retention rate among the new hires is 60%. Females represent 45% of the sample. The overall average age in 2003 is 46 years old, and veterans constitute about 29% of the sample. Of the whole sample, 15% of the workers are migrants.

Migrant employees exhibit higher mean salaries ($53,384) than non-migrants ($47,877), an estimated 11% higher for migrants. This difference could be due to their higher education levels at entry. Migrants are also more likely to be promoted, showing a mean promotion rate of almost 15%, while non-migrants have a rate of 10%. As the human capital model predicts, migrants tend to be younger and have less labor market experience than non-migrants. Compared to the entry cohort, veterans now show lower migration rates, perhaps suggesting moving fatigue due to the many prior moves characteristic of active duty military members. Now that we are able observe their performance ratings, it is of interest that migrants and non-migrants seem to perform no different from each other. No significant differences were encountered with gender and

Table 3. Summary Statistics for Year 2003

	ALL		MIGRANTS		NON-MIGRANTS			
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	T-test	P-value
yrcomp	49225.23	18251.31	53384.79	18028.06	47877.58	18120.56	13.15	0.000
grade	9.6192	3.1625	10.4711	3.0253	9.3432	3.1570	15.60	0.000
lmktexp	10.9056	8.9285	8.6708	8.3289	11.6296	8.9965	-14.47	0.000
totfedyrs	14.6750	6.0565	15.1929	6.2842	14.5071	5.9717	4.90	0.000
perf	3.9105	0.9565	3.9171	0.9646	3.9084	0.9540	0.38	0.701
promote	0.1150	0.3190	0.1496	0.3568	0.1037	0.3049	6.18	0.000
bach0	0.2179	0.4128	0.2535	0.4351	0.2063	0.4047	4.95	0.000
mastr0	0.0839	0.2773	0.0914	0.2882	0.0815	0.2736	1.54	0.123
phd0	0.0140	0.1173	0.0093	0.0960	0.0155	0.1234	-2.27	0.023
female	0.4566	0.4981	0.4513	0.4977	0.4583	0.4983	-0.61	0.544
black	0.1513	0.3584	0.1739	0.3791	0.1440	0.3511	3.61	0.000
hisp	0.0510	0.2199	0.0518	0.2216	0.0507	0.2194	0.21	0.835
white	0.7230	0.4475	0.7048	0.4562	0.7289	0.4445	-2.33	0.020
othrace	0.0725	0.2594	0.0647	0.2460	0.0751	0.2635	-1.73	0.084
army	0.4250	0.4944	0.4424	0.4968	0.4194	0.4935	2.01	0.044
navy	0.1680	0.3739	0.1557	0.3626	0.1720	0.3774	-1.89	0.059
usmc	0.0185	0.1348	0.0137	0.1165	0.0200	0.1402	-2.02	0.043
usaf	0.2500	0.4330	0.2507	0.4335	0.2497	0.4329	0.10	0.920
othagcy	0.1385	0.3455	0.1375	0.3444	0.1389	0.3458	-0.17	0.832
vetrn	0.2995	0.4581	0.2818	0.4500	0.3053	0.4605	-2.21	0.027
biosci	0.0127	0.1118	0.0109	0.1039	0.0132	0.1143	-0.89	0.371
physci	0.0178	0.1323	0.0101	0.1001	0.0203	0.1411	-3.33	0.001
engineer	0.1242	0.3298	0.1488	0.3560	0.1162	0.3205	4.28	0.000
medical	0.1282	0.3344	0.0789	0.2696	0.1442	0.3514	-8.48	0.000
design	0.0156	0.1241	0.0162	0.1262	0.0155	0.1234	0.25	0.803
legal	0.0262	0.1598	0.0267	0.1612	0.0261	0.1594	0.17	0.867
educator	0.0514	0.2207	0.0404	0.1970	0.0549	0.2278	-2.83	0.005
library	0.0046	0.0673	0.0044	0.0666	0.0046	0.0676	-0.09	0.930
logitmgt	0.0881	0.2834	0.1233	0.3289	0.0766	0.2660	7.14	0.000
personnel	0.0426	0.2021	0.0493	0.2166	0.0405	0.1971	1.89	0.058
datasys	0.0013	0.0358	0.0020	0.0449	0.0010	0.0324	1.17	0.240
centmgt	0.0132	0.1140	0.0113	0.1058	0.0138	0.1165	-0.92	0.356
logitech	0.0600	0.2374	0.0526	0.2232	0.0624	0.2418	-1.78	0.075
mgtech	0.0584	0.2345	0.0433	0.2035	0.0633	0.2435	-3.69	0.000
clerk	0.2010	0.4007	0.1945	0.3959	0.2031	0.4023	-0.92	0.356
polfire	0.0638	0.2445	0.0679	0.2517	0.0625	0.2421	0.96	0.336
socsci	0.0293	0.1686	0.0239	0.1526	0.0310	0.1735	-1.84	0.065
Obs.	10,106		2,473		7,633			

race variables between the two groups. Like the entry cohort, the occupations which seem to take advantage of migration are engineers and logistics managers, both showing higher salaries and promotion rates. Employees in the medical field still stand out as being less likely to migrate.

Mean grades for migrants and non-migrants at entry time and in 2003 are compared in Table 3. Migrants enter at higher grades and finish at higher grades, suggesting that a systematic difference exists between migrants and non-migrants.

Table 4. Mean Grades for Migrants and Non-Migrants at Entry and End

	Mean grade at t=0	Mean grade at t=9
Migrants	7.42	10.47
Non-migrants	7.03	9.34

In aggregate, migrants seem to advance an average of 3 grades during the observed ten year period, while non-migrants only advance an average of 2.3 grades. By individual grade, however, average promotion opportunities differ. Table 4 looks at individual grades and their respective average promotion opportunities:

Table 5. Average Grade Growth per Entry Grade

Grade of entry at t=0	Average grade at t=9	Std. Dev.	Min.	Max.
5	8.04	2.68	5	14
6	8.36	1.96	6	13
7	10.89	2.16	7	15
8	9.85	1.61	8	13
9	11.14	1.37	9	15
10	10.80	0.69	10	13
11	12.03	0.93	11	15
12	12.84	0.79	12	15
13	13.54	0.64	13	15
14	14.46	0.50	14	15
15	15	0	15	15

An employee joining DoD at grade 5 received on average 3.04 grade increases for the ten year period, increasing to an average grade of 8.04. Similarly, an individual who entered service at grade 12 received an average of 0.84 grade promotions until the end of the ten year period. The decreasing average promotion rate seems to be a result of the hierarchical nature of the DoD and highlights its structural limitations regarding promotion at higher levels of responsibility. As an individual advances in grade, promotion opportunities tend to decline due to fewer positions available at the upper levels of the hierarchy. The following section discusses the estimation results for the salary regressions.

B. SALARY MODEL ANALYSIS

The Salary Model estimates the determinants of the log of yearly compensation (*lyrcomp*) for DoD employees who remained in service until 2003. As previously mentioned, the salary variable *lyrcomp*, only measures annual base salary and does not include any bonuses the employee may have received. In our model,

$$\log(yrcomp) = \beta_0 + \beta_1 migrate_{it} + \beta_2\, female_i + \beta_3 race_i + \beta_4 education_i + \beta_5 agency_i + \beta_6 vetrn_i + \beta_7 lmktexp_{it} + \beta_8 lmktexpsq_{it} + \beta_9 totfedyrs_{it} + \beta_{10} totfedysq_{it} + \beta_{11} year_t + \beta_{12}\, perf_{it} + \beta_{13} grade_{it} + u_{it},$$

the unobserved composite error u_{it} from each individual is likely to be correlated over time due to the use of pooled OLS on panel data. In panel data, the error term u_{it} is usually defined as:

$$u_{it} = a_i + v_{it},$$

where a_i corresponds to the unobserved individual effect that does not vary over time, or fixed effect. This fixed effect could be in the form of unobserved ability, motivation or any other unobserved factor. The time-varying, or idiosyncratic error, v_{it}, represents the unobserved factors that change over time and across individuals. For individuals, ability is likely to be constant over time, so one way to correct for this fixed effect time correlation is by the use of robust standard errors. The model is therefore estimated by pooled OLS using Newey-West robust standard errors to correct for serial correlation and heteroskedasticity.

Regression estimates are presented in Table 6. The baseline OLS regression includes demographic and human capital attributes, but omits performance and grade variables. The baseline regression results are included in Column 1. Migrants earn 9.3% higher salaries than non-migrants. Women and racial minorities earn lower salaries. Women, in particular, earn 19% lower salaries than men, and female migrants earn even lower salaries (almost 22% less). Veterans also earn lower salaries (4.2% less). As predicted in the human capital model, individuals holding higher education degrees experience higher salaries. PhD degree holders earn about 67% more than people with High School diplomas or less, while Master's degree holders earn 40% higher salaries than High School diploma holders. A Baccalaureate degree increases salaries by almost 30%. Prior experience (*lmktexp*) and prior tenure (*totfedyrs*) acquired before joining the DoD seem to have little impact on salaries, perhaps due to the specialization of positions within the Department of Defense. Tenure before joining

Table 6. Regression Results of the Effect of Migration on Salaries

Dependent Variable: *lyrcomp* (Log of Yearly Compensation)				
Model	(1)OLS	(2)OLS	(3)OLS	(4)OLS
migrate	0.0934	0.0886	-0.0114	0.0494
	(0.0065)***	(0.0074)***	(0.0024)***	(0.0047)***
female	-0.1888	-0.2012	-0.0143	-0.0492
	(0.0052)***	(0.0057)***	(0.0018)***	(0.0033)***
femmig	-0.0293	-0.0107	-0.0038	-0.0004
	(0.0095)***	(0.0109)	(0.0035)	(0.0068)
black	-0.1125	-0.1120	0.0062	-0.0240
	(0.0060)***	(0.0065)***	(0.0019)***	(0.0037)***
hisp	-0.0883	-0.0849	0.0053	-0.0205
	(0.0100)***	(0.0108)***	(0.0030)*	(0.0060)***
othrace	-0.0678	-0.0720	0.0162	0.0040
	(0.0091)***	(0.0096)***	(0.0028)***	(0.0058)
bach0	0.2984	0.2997	0.0128	0.1076
	(0.0055)***	(0.0060)***	(0.0020)***	(0.0040)***
mastr0	0.4066	0.3963	0.0223	0.0728
	(0.0073)***	(0.0077)***	(0.0030)***	(0.0050)***
phd0	0.6713	0.6356	0.1243	0.1200
	(0.0175)***	(0.0180)***	(0.0091)***	(0.0102)***
army	0.0796	0.0599	0.0225	-0.0038
	(0.0075)***	(0.0083)***	(0.0026)***	(0.0045)
navy	0.0865	0.0954	0.0240	0.0351
	(0.0086)***	(0.0093)***	(0.0027)***	(0.0052)***
usmc	0.0176	0.0201	-0.0079	-0.0231
	(0.0166)	(0.0177)	(0.0046)*	(0.0095)**
usaf	0.1276	0.1238	0.0064	-0.0168
	(0.0080)***	(0.0087)***	(0.0027)**	(0.0047)***
vetrn	-0.0427	-0.0377	-0.0281	-0.0235
	(0.0061)***	(0.0066)***	(0.0020)***	(0.0034)***
lmktexp	0.0014	-0.0016	0.0030	-0.0104
	(0.0008)*	(0.0008)*	(0.0003)***	(0.0005)***
lmktexpsq	0.0000	0.0001	-0.0000	0.0002
	(0.0000)	(0.0000)**	(0.0000)***	(0.0000)***
totfedyrs	0.0067	-0.0000	0.0075	-0.0025
	(0.0009)***	(0.0012)	(0.0003)***	(0.0006)***
totfedysq	0.0002	0.0003	-0.0001	0.0000
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)**
time dummies	yes	yes	yes	yes
perf		0.0361	0.0028	0.0068
		(0.0020)***	(0.0007)***	(0.0011)***
grade			0.1120	
			(0.0003)***	
grade0				0.0964
				(0.0005)***
Constant	10.0393	10.0006	9.2766	9.6002
	(0.0095)***	(0.0135)***	(0.0047)***	(0.0082)***
Observations	132,024	104,474	104,474	104,414
R-squared	0.46	0.44	0.91	0.79

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

DoD is used because after joining, everyone's tenure grows by one year for each period, and such variable would be perfectly correlated with the year dummies.

When controlling for performance (Column 2), migrants still experience higher salaries, but a slightly smaller advantage (8.9%) than in the baseline model. This is expected because Column 1 results may be overestimated due to performance advantages affecting salaries. With performance controls, of two people having the same performance rating, the one who migrates is expected to increase compensation by 8.9%. Evidence of potential gender discrimination still exists as females earn 20% less than males. No significant changes occur with race variables, while experience and tenure remain practically insignificant. As in Column 1, the agency that proves to be most profitable for migrant employees is the Navy, with workers earning 9.5% higher salaries to other DoD agencies. Education variables continue to behave in accordance with the human capital model. Most interestingly, a positive performance evaluation rating increases salaries by 3.6%.

At first, it appears that migrants earn more because they migrate; however, when controlling for grade in Column 3 of Table 6, migrants make 1.1% lower salaries than non-migrants. The negative sign on the migration coefficient suggests workers who migrate within grade, do so for reasons other than personal utility maximization; therefore, as seen in Columns 1 and 2, migration seems to be a strategic move for workers to advance and thus increase their salaries. Within grade, the potential gender discrimination evidence is now diminished, with women earning only about 1.4% percent less than men. Race

parameters show no significant increases on salary. Experience and tenure show positive statistically significant coefficients, albeit very small. An increase of one grade is likely to increase yearly compensation by 11%.

The results in Column 4 control for entry grade and performance. Here, the partial effect of *migrate* becomes positive again to almost a 5% increase in salary. Females now earn almost 5% less than men; however, no evidence of tied-movers is apparent, as the female-migrate interaction term is statistically insignificant. Veterans show an estimated 2% lower salaries, and experience and tenure remain of little impact to salaries. As in all prior regressions, investments in education human capital yielded positive salary increases proportional to the level of investment.

The overall significance of the models is explained by the coefficient of determination, or R-squared, which is the proportion of the total variation in the dependent variable, explained by the variation in the explanatory variables. From the reported R-squared, the covariates in Columns 1 and 2 explain approximately 46% and 44% of variation, respectively. When introducing grade in the regression (Column 3), the reported R-squared more than doubles. When controlling for performance and grade, all the covariates explain 91% of the total variation. This is expected because pay in the General Schedule system is rigidly tied to grade levels. The reported R-squared in Column 4 shows 79% of total variation explained when controlling for initial entry grade and performance.

The results in the Salary Model regressions suggest that migration seems to be a strategic move for workers to advance, and therefore increase their wages. It seems that workers migrate in search of promotion opportunities. The Promotion Model regression estimates are reviewed in the next section.

C. PROMOTION MODEL ANALYSIS

The Promotion Model examines the determinants of the probability of promotion (*promote*) for DoD employees who remained in service until 2003. The model was estimated using probit regressions and calculating covariate partial effects. The results of estimating the benchmark probit on the probability of promotion are displayed in Columns 1 and 2 of Table 7. Estimates include demographic, education, agency, tenure and experience variables in all regressions. Like in the Salary Model, performance and grade variables were added to control for additional effects. The baseline regression does not control for performance or grade and its results show that migrants have a 0.21 higher probability of being promoted than non-migrants. This measure seems too large, perhaps due to self-selection, since we are only observing migrants that remained in the sample until 2003. If we had observed other employees who otherwise left the sample, the partial effect might be smaller. Females show no significant partial effects on the probability of promotion, suggesting they have equal opportunities for promotion as males. Out of the racial groups represented, blacks show 5% lower promotion rates than whites. In the education variables, having a Baccalaureate degree increases the partial effect on

Table 7. Probit Model Estimates of the Effect of Migration on the Probability of Promotion

	Dependent Variable: *promote*							
Model	(1)Probit	(2)Partial effects from (1)	(3)Probit	(4)Partial effects from (3)	(5)Probit	(6)Partial effects from (5)	(7)Probit	(8)Partial effects from (7)
migrate	0.6477	0.2127	0.6455	0.2085	0.5966	0.1887	0.6991	0.2260
	(0.0261)***	(0.0099)***	(0.0295)***	(0.0111)***	(0.0295)***	(0.0109)***	(0.0300)***	(0.0113)***
female	0.0082	0.0022	0.0137	0.0036	0.1116	0.0286	-0.1049	-0.0265
	(0.0104)	(0.0028)	(0.0108)	(0.0028)	(0.0113)***	(0.0029)***	(0.0113)***	(0.0028)***
femmig	-0.0746	-0.0192	-0.0181	-0.0046	-0.0100	-0.0025	-0.0391	-0.0097
	(0.0381)*	(0.0095)**	(0.0434)	(0.0110)	(0.0436)	(0.0110)	(0.0438)	(0.0107)
black	-0.0560	-0.0146	-0.0547	-0.0139	0.0077	0.0020	-0.1260	-0.0306
	(0.0130)***	(0.0033)***	(0.0136)***	(0.0034)***	(0.0138)	(0.0035)	(0.0138)***	(0.0032)***
hisp	-0.0282	-0.0074	-0.0448	-0.0114	0.0034	0.0009	-0.0990	-0.0240
	(0.0210)	(0.0055)	(0.0222)**	(0.0055)**	(0.0224)	(0.0057)	(0.0224)***	(0.0052)***
othrace	0.0116	0.0031	0.0135	0.0035	0.0611	0.0160	-0.0489	-0.0121
	(0.0177)	(0.0048)	(0.0185)	(0.0048)	(0.0186)***	(0.0050)***	(0.0187)***	(0.0045)***
bach0	0.0999	0.0272	0.0801	0.0211	-0.0813	-0.0203	0.2502	0.0676
	(0.0112)***	(0.0031)***	(0.0117)***	(0.0031)***	(0.0127)***	(0.0031)***	(0.0125)***	(0.0036)***
mastr0	-0.0939	-0.0241	-0.1055	-0.0261	-0.3125	-0.0699	0.1780	0.0483
	(0.0171)***	(0.0042)***	(0.0180)***	(0.0043)***	(0.0190)***	(0.0037)***	(0.0194)***	(0.0056)***
phd0	-0.4250	-0.0921	-0.3967	-0.0842	-0.6864	-0.1223	0.0730	0.0191
	(0.0440)***	(0.0074)***	(0.0455)***	(0.0076)***	(0.0465)***	(0.0051)***	(0.0471)	(0.0127)
army	-0.2336	-0.0610	-0.2520	-0.0637	-0.2729	-0.0680	-0.2030	-0.0505
	(0.0135)***	(0.0035)***	(0.0146)***	(0.0036)***	(0.0148)***	(0.0036)***	(0.0148)***	(0.0036)***
navy	-0.0805	-0.0209	-0.0853	-0.0215	-0.1232	-0.0302	-0.0365	-0.0091
	(0.0156)***	(0.0039)***	(0.0162)***	(0.0040)***	(0.0164)***	(0.0039)***	(0.0164)**	(0.0041)**
usmc	-0.1503	-0.0374	-0.1573	-0.0378	-0.1694	-0.0399	-0.1214	-0.0290
	(0.0345)***	(0.0080)***	(0.0358)***	(0.0079)***	(0.0359)***	(0.0078)***	(0.0362)***	(0.0081)***
usaf	-0.3038	-0.0752	-0.3075	-0.0739	-0.3748	-0.0873	-0.1866	-0.0452
	(0.0149)***	(0.0034)***	(0.0155)***	(0.0034)***	(0.0157)***	(0.0033)***	(0.0159)***	(0.0037)***
vetrn	0.0284	0.0076	0.0300	0.0078	0.0351	0.0090	0.0215	0.0055
	(0.0120)**	(0.0032)**	(0.0125)**	(0.0033)**	(0.0126)***	(0.0033)***	(0.0127)*	(0.0032)*
lmktexp	-0.0466	-0.0124	-0.0463	-0.0120	-0.0440	-0.0112	-0.0393	-0.0100
	(0.0016)***	(0.0004)***	(0.0017)***	(0.0004)***	(0.0017)***	(0.0004)***	(0.0017)***	(0.0004)***
lmktexpsq	0.0007	0.0002	0.0007	0.0002	0.0006	0.0002	0.0006	0.0001
	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***
totfedyrs	-0.0520	-0.0138	-0.0507	-0.0131	-0.0468	-0.0119	-0.0486	-0.0123
	(0.0025)***	(0.0007)***	(0.0027)***	(0.0007)***	(0.0027)***	(0.0007)***	(0.0027)***	(0.0007)***
totfedysq	0.0007	0.0002	0.0006	0.0002	0.0004	0.0001	0.0009	0.0002
	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***	(0.0001)***	(0.0000)***
time dummies	yes	yes	yes	yes	yes	yes	yes	yes
perf			0.0254	0.0065	0.0059	0.0015	0.0534	0.0135
			(0.0061)***	(0.0016)***	(0.0061)	(0.0016)	(0.0062)***	(0.0016)***
grade					0.0628	0.0160		
					(0.0019)***	(0.0005)***		
grade0							-0.0848	-0.0215
							(0.0020)***	(0.0005)***
Constant	0.3732		0.2733		-0.1199		0.6030	
	(0.0216)***		(0.0335)***		(0.0357)***		(0.0346)***	
Observations	109629	109629	102560	102560	102560	102560	102503	102503
Log likelihood	-50373.45		-46135.45		-45571.67		-45128.92	
P(ŷ=1)		.1839		.1755		.1721		.1727

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

promote. Interestingly, having a degree higher than a Baccalaureate reduces the probability of promotion because highly educated individuals enter at higher grades and have fewer promotion possibilities. All agencies show negative effects on promotion, suggesting other DoD agencies not directly tied to the armed forces have higher promotion

rates. Veterans are more likely to be promoted but the magnitude on the probability of promotion is minimal (0.0076). Prior experience and tenure prior to federal service show negative effects on promotion.

Columns 3 and 4 show the probit results when controlling for performance. Performance, as expected, has a positive effect on promotion. Migrants continue to have significantly larger promotion rates, with the partial effect of *migrate* remaining relatively unchanged. Promotion rates for females appear to be still no different than those of males. Blacks and Hispanics display statistically significant lower rates of promotion of around 0.05 lower than whites. All agencies maintain negative partial effects as well as the experience and tenure variables.

The next probit models additionally control for grade, and the results are displayed in Columns 5 and 6. The partial effect of migration on the probability of promotion is now 0.1887 and remains statistically significant, suggesting that of people within the same grade, those who migrate have an almost 0.19 higher probability of promotion than those who remain in the same location. Within grade, females now have a higher probability of getting promoted (0.02), albeit small. No evidence of racial discrimination exists, as all racial variables are statistically insignificant. Education variables are all negative, as are all agency variables. Veterans continue to exhibit slightly higher promotion rates, while experience, tenure and performance variables seem to have little effect. It seems that for individuals within the same grade, the greatest opportunity for promotion arises with mobility.

The last two probit models in Columns 7 and 8, display the results when controlling for initial grade. The variable of interest, *migrate*, shows the highest partial effect of all regressions (0.2260). This suggests that when two people start at the same grade, the one that migrates has a 0.22 higher probability of getting promoted than the one who does not migrate, ceteris paribus. A slight evidence of potential gender and race discrimination surfaces, since the coefficients of the demographic variables are all negative and statistically significant. Education variables all show positive partial effects, with the effect decreasing the higher the degree. This is expected and suggests that as two workers of the same initial grade gain human capital, earning an advanced degree increases the probability of promotion; but the higher the grade, the probability decreases (but remains positive) due to the limited spaces available at higher levels. Agencies continue to display negative partial effects, while prior experience and tenure remain of little impact.

The results of the Promotion Model regressions support the prior premise of migration as a strategic move for workers to advance. Throughout all regressions, *migrate* displays a positive partial effect of at least 0.18. Furthermore, the female-migrate interaction in all four regressions shows no evidence of females migrating due to a tied-move. The partial effects of *femmig* remain negative in all regressions. In the last six columns, the coefficients are statistically insignificant, suggesting that women within the DoD are in search of improving individual wages and personal utility. Veterans seem to

have a minimal advantage as they exhibit marginally higher promotion rates.

D. SELECTION CORRECTION

Estimates on panel data are widely recognized to be subject to selection bias. Due to attrition, the amount of civil service personnel employed in 2003 is not the same as the amount who commenced the panel sample in 1994 and 1995. In a truncated sample, we cannot observe the behavior of those who left the sample; therefore, a truncated regression model arises when we exclude, on the basis of the dependent variable, a subset of the population in our sample scheme. Non-random samples can arise from either exogenous sample selection, meaning the sample selection is based on explanatory variables independent of the error term; or endogenous, in which the sample is related to the dependent variable, either directly or through the error term. Endogenous explanatory variables are correlated with the error term due to an omitted variable or measurement error and thus yield biased estimates.

The employees who leave the DoD may be placed into two categories: high performers or poor performers. If the workers who leave the DoD belong to the high performing category, then they are more likely to experience higher promotion rates prior to separation than their peers. High performers also exhibit above-average skills and thus partake of greater employment opportunities outside the DoD. If the DoD employees are low performers, then they may experience below-average advancement rates and thus be more likely to leave and search for other opportunities elsewhere. If the leavers are low performers, our results

based on performance ratings are probably upward biased; alternatively, if the leavers are high performers, the estimates are likely to exhibit a downward bias.

To correct for sample selection bias, two different empirical approaches are used, depending on the model estimated. In the Salary Model, a Heckman selection technique is utilized, whereas for the binary promotion model, a similar Heckman-type correction, but with a probit model in the second stage, is applied. The Heckman selection model (Heckman 1979) adds an explicit selection equation to the population of interest, where

$$y = x\beta + u\,, \quad E(u \mid x) = 0$$

is the population equation and

$$P(s = 1 \mid z) = z\gamma + v$$

is the selection equation. Whether the value of *y* for a person will be observed depends on a number of observable factors *z* and a random term *v*. The set *z* should include the set *x* and have at least one more variable that affects selection, but does not affect *y*. For the Heckman probit technique, the population equation is

$$P(y = 1 \mid x) = \Phi(x\beta + u)\,,$$

while the selection equation remains

$$P(s = 1 \mid z) = z\gamma + v\,.$$

Both selection-corrected models are estimated through partial maximum likelihood (MLE), a non-linear method which involves the simultaneous estimation of both the population and selection equations.

The two stage models assume that stay-leave decisions are based on the cost and return to leaving. The expected return depends in part on demographic characteristics, education and productivity in alternate occupational activities. Alternate job prospects are proxied by dummy variables for major occupational categories. Although retention rates will vary across occupations due to differences in alternative job availabilities; promotion rates should not vary across occupations. Similarly, local labor market conditions are proxied by dummies representing the state of the worker's duty location. This approach represents a fixed effects estimate where the dummies capture permanent deviations between the retention rate for a given occupation or state and the overall sample average. The indicator variables for occupations and local labor market conditions serve as the identifying instruments.

Since we estimate a static 2003 model, three variables were adjusted to compensate for any missing values. The binary variable *evermig* was generated to substitute the original migration variable, and equals to one if an individual ever observed a migratory move during the ten year period. For individuals who left the sample by 2003, the missing values for *grade* were replaced with their last observed grade, and missing values for the performance variable where replaced with the average of the overall observed performance ratings.

The selection-adjusted outcomes are presented in Tables 8 and 9. First-stage retention models are displayed in Appendix Tables A and B. The selection-corrected Salary Model (Table 8) shows that migrants earn close to 6% higher salaries than non-migrants. Females earn 15% lower

Table 8. Selection Adjusted Estimates of the Effect of Migration on Salaries

	Dependent Variable: *lyrcomp*			
Model	(1)	(2)	(3)	(4)
evermig	0.0577	0.0647	-0.0060	0.0551
	(0.0070)***	(0.0069)***	(0.0026)**	(0.0053)***
female	-0.1561	-0.1645	-0.0289	-0.0422
	(0.0097)***	(0.0096)***	(0.0032)***	(0.0072)***
femmig	0.0333	0.0345	-0.0248	0.0383
	(0.0220)	(0.0228)	(0.0082)***	(0.0183)**
black	-0.1061	-0.1005	0.0106	-0.0289
	(0.0116)***	(0.0117)***	(0.0045)**	(0.0086)***
hisp	-0.1029	-0.0968	0.0099	-0.0431
	(0.0180)***	(0.0180)***	(0.0051)*	(0.0126)***
othrace	-0.1351	-0.1110	0.0151	-0.0357
	(0.0155)***	(0.0152)***	(0.0045)***	(0.0110)***
bach0	0.2449	0.2471	0.0210	0.1090
	(0.0100)***	(0.0096)***	(0.0033)***	(0.0073)***
mastr0	0.3214	0.3170	0.0305	0.0727
	(0.0134)***	(0.0129)***	(0.0044)***	(0.0098)***
phd0	0.5955	0.5917	0.1141	0.1669
	(0.0308)***	(0.0299)***	(0.0110)***	(0.0229)***
army	-0.0018	-0.0625	0.0161	-0.0669
	(0.0145)	(0.0150)***	(0.0091)*	(0.0112)***
navy	0.0585	0.0797	0.0341	0.0388
	(0.0155)***	(0.0157)***	(0.0095)***	(0.0121)***
usmc	-0.0068	0.0020	0.0004	-0.0224
	(0.0300)	(0.0294)	(0.0110)	(0.0214)
usaf	0.0155	0.0417	0.0104	-0.0492
	(0.0148)	(0.0144)***	(0.0094)	(0.0104)***
vetrn	-0.0520	-0.0475	-0.0248	-0.0249
	(0.0109)***	(0.0107)***	(0.0041)***	(0.0080)***
lmktexp	-0.0145	-0.0133	0.0024	-0.0192
	(0.0016)***	(0.0016)***	(0.0007)***	(0.0013)***
lmktexpsq	0.0004	0.0003	-0.0000	0.0004
	(0.0001)***	(0.0001)***	(0.0000)	(0.0000)***
totfedyrs	-0.0418	-0.0344	0.0032	-0.0300
	(0.0043)***	(0.0037)***	(0.0010)***	(0.0030)***
totfedysq	0.0011	0.0010	0.0000	0.0006
	(0.0001)***	(0.0001)***	(0.0000)*	(0.0001)***
avgperf		0.1079	0.0095	0.0490
		(0.0080)***	(0.0043)**	(0.0065)***
grade			0.1144	
			(0.0009)***	
grade0				0.0803
				(0.0013)***
Constant	11.5104	10.9116	9.5054	10.5978
	(0.0640)***	(0.0532)***	(0.0253)***	(0.0511)***
Observations	22,852	18,504	18,504	18,488
Censored obs.	12,762	8,468	8,468	8,459
λ	-0.4479	-0.4324	0.0068	-0.3184
se(λ)	0.0360	0.0335	0.0019	0.0395

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

salaries, even when controlling for performance (Column 2). Minorities also earn less, compared to whites, suggesting potential evidence of gender and race discrimination. As expected, education plays a significant effect on annual salaries as advanced degree holders display positive and statistically significant coefficients. All agencies show insignificant partial effects on salary, except for Navy employees, who earn close to 6% higher salaries. Veterans earn 5% less than non-veterans. It seems that prior experience, either in the labor market or federal service, plays no role in DoD salary expectations, as evidenced in the negative partial effects for experience and tenure variables. This can be due to the uniqueness of the specific training characteristics of DoD occupations. As expected, performance has a positive effect on yearly compensation and controls for about 11% of salaries.

When controlling for grade (Column 3), migrants seem to earn slightly less than non-migrants. The difference, while statistically significant, is so minute that there is no practical difference (migrants earn 0.6% less). While females continue to earn less than males, the difference is smaller, with women earning around 3% less. Within grade, no evidence of race discrimination occurs, with all race variables displaying positive partial effects. Education variables show no change in direction, but do so in magnitude. As expected, they are now smaller since we are observing individuals within grade.

The female-migration interaction term shows interesting results across all columns when corrected for selection. By definition, female tied-movers migrate to increase household income utility, not necessarily their

own wages. In the prior regressions in Table 6, the negative coefficients on *femmig* suggest evidence of females acting as tied-movers. When controlling for selection (Table 8), the coefficients become positive (except within grade), suggesting that women who are tied-movers have left the sample. Assuming we see everyone in the sample, the Heckman corrected results on *femmig* show a positive return with women also searching for personal utility maximization. Within grade (Column 3), however, females that move must do so for reasons other than increases in salary.

Throughout the first three selection-corrected regressions, the returns to education on salaries are positive and proportional to the degree attained. When controlling for initial grade (Column 4), interestingly, Baccalaureates and PhD's earn similar returns (12%), both higher than the salary returns for a Master's degree (8%). An explanation could be an underutilization of PhD's or diversification of positions occupied by Baccalaureates.

Overall, the effects of migration are consistently positive but smaller in magnitude than the prior uncorrected results, still suggesting migration is a strategic move for workers to advance. Females still earn lower salaries than men, and veterans' results remain practically unchanged, still showing veterans earning less than non-veterans. We now turn our attention to the Promotion Model.

Table 9 displays the selection-adjusted estimates on the Promotion Model. Migrant employees throughout all regressions continue to have a higher probability of promotion compared to non-migrants; however, the magnitude

Table 9. Selection Adjusted Estimates of the Effect of Migration on the Probability of Promotion

	Dependent Variable: *promote*							
	(1)	Partial Effects from (1)	(2)	Partial Effects from (2)	(3)	Partial Effects from (3)	(4)	Partial Effects from (4)
evermig	0.1098	0.0298	0.1084	0.0295	0.0700	0.0203	0.1147	0.0349
	(0.0387)***		(0.0386)***		(0.0370)*		(0.0375)***	
female	0.2322	0.0611	0.2383	0.0632	0.2488	0.0711	0.1529	0.0455
	(0.0388)***		(0.0386)***		(0.0422)***		(0.0383)***	
femmig	0.8498	0.2935	0.8579	0.2976	0.8057	0.2876	0.8280	0.3020
	(0.1100)***		(0.1122)***		(0.1100)***		(0.1109)***	
black	0.0017	0.0004	0.0095	0.0025	0.0199	0.0057	-0.0323	-0.0095
	(0.0461)		(0.0459)		(0.0464)		(0.0446)	
hisp	-0.0289	-0.0075	-0.0341	-0.0089	-0.0254	-0.0072	-0.0783	-0.0226
	(0.0749)		(0.0747)		(0.0745)		(0.0727)	
othrace	-0.0305	-0.0079	-0.0258	-0.0068	-0.0208	-0.0059	-0.0792	-0.0229
	(0.0652)		(0.0647)		(0.0656)		(0.0627)	
bach0	-0.1859	-0.0465	-0.1829	-0.0461	-0.1932	-0.0526	-0.0788	-0.0230
	(0.0434)***		(0.0429)***		(0.0553)***		(0.0430)*	
mastr0	-0.2811	-0.0659	-0.2788	-0.0660	-0.2792	-0.0718	-0.0883	-0.0255
	(0.0667)***		(0.0661)***		(0.0828)***		(0.0673)	
phd0	-0.5677	-0.1124	-0.5418	-0.1098	-0.5192	-0.1170	-0.1808	-0.0500
	(0.1995)***		(0.1983)***		(0.2175)**		(0.1939)	
army	-0.0491	-0.0129	-0.1105	-0.0290	-0.1076	-0.0304	-0.1027	-0.0303
	(0.0505)		(0.0550)**		(0.0520)**		(0.0529)*	
navy	-0.1858	-0.0462	-0.1731	-0.0435	-0.1700	-0.0463	-0.1322	-0.0380
	(0.0602)***		(0.0602)***		(0.0607)***		(0.0585)**	
usmc	-0.0146	-0.0038	-0.0136	-0.0036	-0.0227	-0.0064	0.0063	0.0019
	(0.1271)		(0.1263)		(0.1228)		(0.1227)	
usaf	-0.1897	-0.0476	-0.1808	-0.0459	-0.1768	-0.0485	-0.1058	-0.0307
	(0.0558)***		(0.0551)***		(0.0542)***		(0.0538)**	
vetrn	0.0504	0.0134	0.0440	0.0118	0.0288	0.0082	0.0253	0.0076
	(0.0448)		(0.0449)		(0.0441)		(0.0438)	
lmktexp	-0.0205	-0.0054	-0.0213	-0.0056	-0.0195	-0.0056	-0.0189	-0.0056
	(0.0064)***		(0.0064)***		(0.0064)***		(0.0061)***	
lmktexpsq	0.0002	0.0000	0.0002	0.0001	0.0002	0.0001	0.0002	0.0001
	(0.0002)		(0.0002)		(0.0002)		(0.0002)	
totfedyrs	0.0069	0.0018	0.0108	0.0029	0.0077	0.0022	-0.0012	-0.0004
	(0.0175)		(0.0175)		(0.0181)		(0.0169)	
totfedysq	-0.0009	-0.0002	-0.0009	-0.0002	-0.0008	-0.0002	-0.0004	-0.0001
	(0.0005)*		(0.0005)*		(0.0005)		(0.0005)	
avgperf			0.0856	0.0227	0.0866	0.0247	0.1232	0.0366
			(0.0325)***		(0.0338)**		(0.0315)***	
grade					0.0061	0.0017		
					(0.0160)			
grade0							-0.0579	-0.0172
							(0.0064)***	
Constant	-0.6018		-0.9732		-0.9402		-0.5840	
	(0.2516)**		(0.2784)***		(0.3613)***		(0.2722)**	
Observations	22,695		18,364		18,364		18,348	
Censored obs.	12,762.00		8,468.00		8,468.00		8,459.00	
$P(\hat{y}=1\|s=1)$		0.1112		0.1119		0.1031		0.1121
ρ	-0.33		-0.39		-0.52		-0.52	
LR test of indep. eqns. (ρ=0):	χ^2=8.01 p-value= 0.0047		χ^2=6.69 p-value= 0.0097		χ^2=12.15 p-value= 0.0005		χ^2=12.41 p-value= 0.0004	
Log likelihood	-17,960.09		-15,370.06		-14,540.98		-15,305.59	
Log likelihood cens.	-17,964.09		-15,373.41		-14,547.05		-15,311.79	

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

is smaller than previously reported. When controlling for selection, the return to migration has a partial effect of approximately 0.03. Females now show positive and significant partial effects in all regressions, suggesting that women promote at a faster rate than men. Of most significance, female migrants (*femmig*) display the highest increase in probability of promotion, from negative coefficients in Table 9, to an almost 0.30 higher probability of getting promoted over males. This result confirms the studies by Mehay and Pema (2004) asserting that females are better performers and are more likely to be promoted. Race variables show statistically insignificant coefficients, disproving prior claims of potential race discrimination. The returns to education in terms of promotion opportunities are negative for all degree holders in the baseline regression (Column 1) and when controlling for performance (Column 2) and grade (Column 3). When controlling for initial grade (Column 4), the returns are no different than zero. It seems that education plays a large role in determining initial salaries and higher starting positions; however, in itself education is no guarantee for promotion. Performance, as expected, has a positive effect on promotion. Veterans show no significant advantages in promotion compared to non-veterans, and prior labor market and federal experience do not increase the probability of promotion either. It appears that in the DoD employee promotion opportunities are not based on any sort of prior labor market, federal or military experience, ceteris paribus.

Overall, the selection-corrected estimates changed the magnitude of the effects of migration on salaries and

promotion. The direction of those effects remained the same. The results also suggest that although minorities are paid less, they have the same opportunities for promotion than whites. Like minorities, females are also paid less, but have higher promotion rates than men.

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V. SUMMARY AND RECOMMENDATIONS

A. SUMMARY

The purpose of this study was to examine the returns to migration in terms of salary and promotion expectations for civilian DoD employees who were hired in 1994 and 1995 and who stayed in civil service until 2003. Specifically, the following questions were explored:

- Is mobility within the DoD internal labor market associated with higher promotions or salary returns?
- Would males and females behave differently in terms of promotion opportunities?
- Since veterans may have superior information and lower psychic costs, are they benefiting from higher returns to mobility?

The data used in our study were provided by the Defense Manpower Data Center and were drawn from the Department of Defense Civilian Personnel Data Files. The dataset included two cohorts of personnel whose careers were followed from 1994-1995 until 2003. The final dataset consisted of 21,143 General Schedule employees between the ages of 21 and 61 at the time of entry. A total of 3,267 personnel (15.4% of the sample) were interstate migrants. The data were set up as an unbalanced panel with a total of 132,068 observations.

For our study, migration was defined as individuals changing duty location from one state to another in a given year. Promotion was defined as a change in grade from one year to another. Two empirical models were developed, one

for estimating salary determinants and one for promotion factors. The Salary Model was estimated using Ordinary Least Squares regression, while the Promotion Model was calculated using probit estimates. Both models were corrected for selection bias using Heckman techniques. The two models included demographic, education and experience characteristics. In the selection-corrected estimates, alternate job opportunities were proxied by occupational dummies while labor market conditions were proxied with state dummy variables. Table 10 provides an overview of the Salary Model results for the coefficients of interest.

Table 10. Summary of Statistically Significant Partial Effects of Interest: Salary Model

Dependent Variable: *lyrcomp*				
Method	(1) OLS	(2) OLS	(3) OLS	(4) OLS
migrate	0.0934	0.0886	-0.0114	0.0494
female	-0.1888	-0.2012	-0.0143	-0.0492
femmig	-0.0293	-	-	-
vetrn	-0.0427	-0.0377	-0.0281	-0.0235
Heckman Corrected Estimates:				
Method	(1) MLE	(2) MLE	(3) MLE	(4) MLE
evermig	0.0577	0.0647	-0.0060	0.0551
female	-0.1561	-0.1645	-0.0289	-0.0422
femmig	-	-	-0.0248	0.0383
vetrn	-0.0520	-0.0475	-0.0248	-0.0249
Additional Controls	-	*perf*	*grade*	*grade0*

The results of the estimations show a positive effect of migration on the log of yearly compensation. Initially, migrant workers earned around 9% higher salaries than non-migrants, and when comparing individuals who started in the same grade (Column 4), the migrants observe an estimated 5% higher salaries than non-mobile employees. In the Heckman estimates, the partial effect of migration remains higher for migrants, fluctuating between 5% and 6%. Within grade

(Column 3), the effects are negative because salaries are determined to a large extent by grade level.

At first, the negative partial effect on *femmig* appears to suggest evidence of women acting as tied-movers; however, the coefficients become insignificant nullifying the tied-mover effect. The selection-corrected coefficients shift to become positive, implying tied-movers have left the sample. Despite the shift, and lack of evidence of tied-moves, females consistently earn less, even in the selection corrected models, indicating a potential occurrence of gender discrimination.

Throughout all regression veterans consistently earned less than non-veterans. This could be because veterans may be averse to moving as they likely have experienced many moves in their active duty military career. Alternatively, their possession of superior information regarding the DoD may place them in primary locations where the opportunity cost of migration is higher than the utility they receive from their current duty location.

The Promotion Model also displays favorable results toward migrants. In all regressions, migrants show higher promotion rates than non-migrants. The selection-corrected model levels the probability of promotion for mobile workers at around 0.03 higher than non-migrant employees. A review of the Promotion Model results is presented in Table 11.

At first, females seem to promote slower than men, with some insignificant coefficients. With the Heckman correction; however, women promote faster than men. Most markedly, female migrants have especially high promotion

rates, suggesting that females are more mobile and more likely to get promoted than males. Veterans and non-veterans behave no different from each other when it comes to promotion opportunities. Because of the statistically insignificant results, it appears neither group has an advantage over the other.

Table 11. Summary of Statistically Significant Partial Effects of Interest: Promotion Model

	Dependent Variable: *promote*			
Method	(1) Probit	(2) Probit	(3) Probit	(4) Probit
migrate	0.2127	0.2085	0.1887	0.2260
female	-	-	0.0286	-0.0265
femmig	-0.0192	-	-	-
vetrn	0.0076	0.0078	0.0090	0.0055
Heckman Corrected Estimates:				
Method	(1) MLE	(2) MLE	(3) MLE	(4) MLE
evermig	0.0298	0.0295	0.0203	0.0349
female	0.0611	0.0632	0.0711	0.0455
femmig	0.2935	0.2976	0.2876	0.3020
vetrn	-	-	-	-
Additional controls	-	*perf*	*grade*	*grade0*

The predicted probabilities of staying in the sample and getting promoted are presented in Table 12 and were calculated from the selection-corrected promotion estimates:

Table 12. Predicted Probabilities of Staying in Sample and Experiencing Promotion

Predicted Probability of Staying and Promoting:				
Heckman Model:	(1) MLE	(2) MLE	(3) MLE	(4) MLE
Migrants	0.0677	0.0801	0.0871	0.0800
Non-Migrants	0.0450	0.0556	0.0541	0.0555
Percent Change for Migrants	+50.4%	+44.1%	+61.0%	+44.1%

The table shows that, on average, when workers are predicted to remain in the sample and migrate, their probability of promotion is at least 44% higher. Within grade, the predicted probability is highest, with migrant workers having a 61% higher probability of promotion.

Discussing other covariates, prior labor market and prior federal experience have minimal to no effect on salaries or the probability of promotion. As expected, education has a positive effect on salaries and it appears that education plays a large role in determining initial salaries and higher positions, but education itself is not a guarantee for promotion. Although the results suggest minorities are paid less, they experience the same opportunities for promotion as whites.

Within the Department of Defense civilian internal labor market, the greatest opportunities for promotion arise with mobility. Migration seems to be a strategic move for workers to advance and maximize their personal utility since migrants earn higher salaries than non-migrants. Migrants are also more likely to be promoted than stationary workers. Females present no evidence of tied-mover effects, and pursue promotion and salary opportunities like males. Women promote faster than men, and women who migrate increase their chances of promotion even more. Females, however, earn lower salaries than males. Veterans earn lower salaries than non-veterans, and have no significant advantages in promotion over their counterparts, disproving our premise that veterans may benefit from superior information on the Department of Defense.

B. RECOMMENDATIONS

Further studies can be conducted regarding DoD internal migration. One possible research path could look at migration, not within states, but across counties or cities. This way, we could capture a larger sample of migrants. Another could be to focus on specific large Metropolitan Statistical Areas, like the District of Columbia (DC). The DC Metropolitan Statistical Area encompasses three states, thus interstate migration may occur within the local area. Another area of interest is exploring the connection between over-education and internal migration. The labor literature suggests that workers with more education than the minimum requirements for the job are likely to be maxed out within their specific job categories; therefore, their only opportunity for advancement is to change positions within the same firm. Some of this mobility could be across states or cities. Finally, analytical techniques like survival analysis may be applied to the dataset to understand when people leave the sample, and thus narrow the reasons for why they leave.

APPENDIX

Table A. First Stage Retention Probit Estimates: Salary Model

	Dependent Variable: *stay*			
	From Model (1) Table 8	From Model (2) Table 8	From Model (3) Table 8	From Model (4) Table 8
female	-0.0575	-0.0577	0.0607	-0.0456
	(0.0190)***	(0.0208)***	(0.0243)**	(0.0218)**
black	-0.0602	-0.0619	0.1364	-0.0413
	(0.0236)**	(0.0258)**	(0.0286)***	(0.0259)
hisp	0.1049	0.1185	0.1829	0.0943
	(0.0389)***	(0.0431)***	(0.0464)***	(0.0426)**
othrace	0.1549	0.1248	0.2462	0.1065
	(0.0345)***	(0.0375)***	(0.0419)***	(0.0379)***
bach0	-0.0563	-0.0921	-0.2432	-0.0314
	(0.0213)***	(0.0234)***	(0.0274)***	(0.0241)
mastr0	-0.0599	-0.0866	-0.3268	-0.0043
	(0.0311)*	(0.0337)**	(0.0401)***	(0.0349)
phd0	-0.2623	-0.3228	-0.7110	-0.1384
	(0.0688)***	(0.0732)***	(0.0819)***	(0.0738)*
army	0.1873	0.2274	0.1456	0.2656
	(0.0300)***	(0.0352)***	(0.0356)***	(0.0362)***
navy	0.0452	0.0214	0.0204	0.0737
	(0.0331)	(0.0370)	(0.0380)	(0.0375)**
usmc	0.0730	0.0760	0.0761	0.1025
	(0.0654)	(0.0710)	(0.0752)	(0.0714)
usaf	0.2354	0.1670	-0.0757	0.1863
	(0.0320)***	(0.0357)***	(0.0362)**	(0.0362)***
vetrn	0.1285	0.1171	0.0845	0.1205
	(0.0220)***	(0.0240)***	(0.0266)***	(0.0240)***
lmktexp	0.0345	0.0319	0.0333	0.0317
	(0.0029)***	(0.0033)***	(0.0035)***	(0.0033)***
lmktexpsq	-0.0008	-0.0008	-0.0008	-0.0008
	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***
totfedyrs	0.1027	0.0806	0.0850	0.0746
	(0.0065)***	(0.0069)***	(0.0072)***	(0.0070)***
totfedysq	-0.0023	-0.0019	-0.0022	-0.0018
	(0.0002)***	(0.0002)***	(0.0002)***	(0.0002)***
avgperf	-	-0.0954	-0.1708	-0.0886
		(0.0162)***	(0.0170)***	(0.0165)***
grade	-	-	0.1643	-
			(0.0044)***	
grade0	-	-	-	-0.0061
				(0.0038)
biosci	-0.2511	-0.3011	-0.1678	-0.3408
	(0.0510)***	(0.0560)***	(0.0917)*	(0.0648)***
physci	-0.3200	-0.3252	-0.4391	-0.4837
	(0.0462)***	(0.0499)***	(0.0659)***	(0.0536)***
engineer	0.0292	-0.0389	-0.1365	0.0583
	(0.0263)	(0.0259)	(0.0400)***	(0.0307)*
medical	-0.3647	-0.3231	-0.1809	-0.5136
	(0.0330)***	(0.0346)***	(0.0357)***	(0.0379)***
design	-0.2401	-0.2792	-0.0136	-0.3092
	(0.0460)***	(0.0497)***	(0.0849)	(0.0569)***
legal	0.3038	0.2462	0.0070	-0.1261
	(0.0486)***	(0.0495)***	(0.0717)	(0.0415)***
educator	-0.2313	-0.2833	-0.0569	-0.2932

	(0.0278)***	(0.0308)***	(0.0509)	(0.0318)***
library	-0.5918	-0.6015	0.0179	-0.5975
	(0.0902)***	(0.0998)***	(0.1402)	(0.0904)***
logitmgt	-0.0770	-0.1369	-0.1018	-0.0933
	(0.0255)***	(0.0259)***	(0.0413)**	(0.0296)***
personnel	-0.1861	-0.2030	-0.0478	-0.1688
	(0.0310)***	(0.0350)***	(0.0509)	(0.0345)***
datasys	-1.5416	-1.5616	-2.1639	-1.5532
	(0.1509)***	(0.1624)***	(0.1407)***	(0.1823)***
centmgt	-0.2994	-0.3675	-0.0767	-0.4341
	(0.0525)***	(0.0571)***	(0.0901)	(0.0582)***
logitech	-0.4090	-0.4242	-0.1486	-0.4239
	(0.0350)***	(0.0404)***	(0.0442)***	(0.0411)***
mgtech	-0.7042	-0.7228	0.1390	-0.6178
	(0.0278)***	(0.0317)***	(0.0461)***	(0.0311)***
clerk	-0.4219	-0.4612	0.1426	-0.3973
	(0.0223)***	(0.0260)***	(0.0306)***	(0.0243)***
polfire	-0.4328	-0.4482	0.0792	-0.3479
	(0.0412)***	(0.0444)***	(0.0459)*	(0.0485)***
socsci	-0.4053	-0.4279	-0.3313	-0.5440
	(0.0388)***	(0.0415)***	(0.0586)***	(0.0480)***
state dummies	yes	yes	yes	yes
Constant	-0.8999	-0.0204	-1.2764	-0.0036
	(0.0727)***	(0.1015)	(0.1252)***	(0.1032)
Observations	22,852	18,504	18,504	18,488

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table B. First Stage Retention Probit Estimates: Promotion Model

	Dependent Variable: *stay*			
	From Model (1) Table 9	From Model (2) Table 9	From Model (3) Table 9	From Model (4) Table 9
female	-0.1008	-0.1307	0.0579	-0.0933
	(0.0208)***	(0.0232)***	(0.0244)**	(0.0238)***
black	-0.0320	-0.0361	0.1325	-0.0129
	(0.0248)	(0.0274)	(0.0285)***	(0.0277)
hisp	0.0741	0.0823	0.1741	0.0952
	(0.0410)*	(0.0457)*	(0.0470)***	(0.0458)**
othrace	0.1865	0.1571	0.2426	0.1706
	(0.0364)***	(0.0401)***	(0.0411)***	(0.0401)***
bach0	0.0648	0.0687	-0.2433	0.0280
	(0.0232)***	(0.0258)***	(0.0278)***	(0.0265)
mastr0	0.0848	0.1026	-0.3250	0.0267
	(0.0344)**	(0.0382)***	(0.0405)***	(0.0398)
phd0	-0.0772	-0.1069	-0.6974	-0.2285
	(0.0734)	(0.0799)	(0.0821)***	(0.0818)***
army	0.1879	0.2546	0.1627	0.2464
	(0.0296)***	(0.0340)***	(0.0350)***	(0.0341)***
navy	0.1044	0.1186	0.0324	0.1113
	(0.0333)***	(0.0368)***	(0.0380)	(0.0368)***
usmc	0.0943	0.1475	0.0807	0.1373
	(0.0681)	(0.0757)*	(0.0784)	(0.0758)*
usaf	0.2049	0.1773	-0.0617	0.1431
	(0.0314)***	(0.0346)***	(0.0361)*	(0.0352)***
vetrn	0.1156	0.0944	0.0804	0.0948
	(0.0232)***	(0.0257)***	(0.0264)***	(0.0258)***
lmktexp	0.0337	0.0304	0.0338	0.0281
	(0.0030)***	(0.0034)***	(0.0035)***	(0.0034)***
lmktexpsq	-0.0008	-0.0007	-0.0008	-0.0007
	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***
totfedyrs	0.1182	0.0893	0.0945	0.0885
	(0.0065)***	(0.0070)***	(0.0072)***	(0.0070)***
totfedysq	-0.0026	-0.0021	-0.0024	-0.0022
	(0.0002)***	(0.0002)***	(0.0002)***	(0.0002)***
avgperf	-	-0.0932	-0.1703	-0.1051
		(0.0160)***	(0.0166)***	(0.0161)***
grade	-	-	0.1650	-
			(0.0042)***	
grade0	-	-	-	0.0262
				(0.0041)***
biosci	-0.0810	-0.1533	-0.1590	-0.1559
	(0.0809)	(0.0885)*	(0.0894)*	(0.0874)*
physci	-0.4431	-0.4421	-0.4268	-0.4432
	(0.0608)***	(0.0680)***	(0.0703)***	(0.0679)***
engineer	0.1246	0.0063	-0.1436	-0.0099
	(0.0363)***	(0.0396)	(0.0403)***	(0.0391)
medical	-0.4212	-0.3571	-0.2013	-0.3729
	(0.0308)***	(0.0345)***	(0.0350)***	(0.0337)***
design	-0.0149	-0.0248	-0.0133	-0.0250
	(0.0761)	(0.0839)	(0.0855)	(0.0829)
legal	0.1784	0.0754	-0.0490	0.0296
	(0.0653)***	(0.0703)	(0.0715)	(0.0694)
educator	-0.0325	-0.1147	-0.0954	-0.1306
	(0.0461)	(0.0511)**	(0.0518)*	(0.0504)***
library	-0.3363	-0.3469	0.0004	-0.3130
	(0.1241)***	(0.1355)**	(0.1386)	(0.1342)**
logitmgt	0.0867	0.0097	-0.0884	0.0094
	(0.0372)**	(0.0404)	(0.0417)**	(0.0399)

personnel	-0.0749	-0.0732	-0.0541	-0.0635
	(0.0456)	(0.0501)	(0.0509)	(0.0494)
datasys	-1.9694	-2.0663	-2.1599	-2.0960
	(0.1242)***	(0.1308)***	(0.1295)***	(0.1304)***
centmgt	-0.0856	-0.1729	-0.1175	-0.1790
	(0.0812)	(0.0875)**	(0.0888)	(0.0867)**
logitech	-0.3421	-0.3727	-0.1567	-0.3625
	(0.0371)***	(0.0406)***	(0.0420)***	(0.0404)***
mgtech	-0.3753	-0.3102	0.1488	-0.2742
	(0.0385)***	(0.0437)***	(0.0459)***	(0.0438)***
clerk	-0.1643	-0.1661	0.1464	-0.1401
	(0.0258)***	(0.0284)***	(0.0301)***	(0.0285)***
polfire	-0.2174	-0.2098	0.1211	-0.1718
	(0.0397)***	(0.0452)***	(0.0465)***	(0.0446)***
socsci	-0.3814	-0.3992	-0.3526	-0.4115
	(0.0508)***	(0.0563)***	(0.0569)***	(0.0558)***
state dummies	yes	yes	yes	yes
Constant	-1.0607	-0.1642	-1.4129	-0.2650
	(0.0901)***	(0.1178)	(0.1253)***	(0.1184)**
Observations	22,695	18,364	18,364	18,348

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

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